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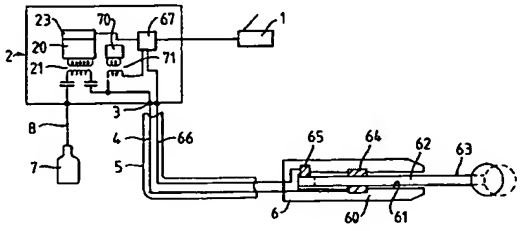
(54) Safety appliance for electrosurgery or welding.

(57) The handset 6 of electrosurgery or welding apparatus has two spaced contacts 64 and 65 which make connection with the shaft 62 of an electrode 63. A low power alternating signal generator 70 is connected to the forward contact 64 so that, when the electrode is fully inserted and contacts the rear electrode 65, the alternating signal is supplied to a detector 67. The detector 67 is connected to a power generator 20 and turns it on when the alternating signal is detected so that electrosurgery power is supplied to the forward contact 64.

Fig.1.



EP 0 569 130 A1

This invention relates to electrical apparatus of the kind including a power supply unit, a handset having a contact that makes electrical connection with an electrode, and a cable connecting the power supply unit to the contact in the handset.

The invention is more particularly concerned with apparatus having an electrode mounted in a handset and supplied with electrical power. The apparatus might, for example, be electrosurgery apparatus or welding apparatus.

In electrosurgery apparatus, the handset has an electrically-insulating casing that may have one or more switches to control supply of power to the electrode. The metal electrode itself is a sterilizable component that is plugged into a socket in the handset. Different shape electrodes can be used for different applications, with the same handset. RF power is supplied from the supply unit, via a cable, to the socket in the handset and thereby to the electrode.

One problem that arises is that, if the electrode were not fully inserted in the handset, it might not make proper electrical contact with the socket. This could cause arcing within the handset between the socket and the electrode and a reduction in the power supplied to the electrode that may not be immediately apparent to the user. The arcing could also lead to damage to the electrode or to the handset.

It is an object of the present invention to provide electrical apparatus that avoids this problem.

According to the present invention there is provided electrical apparatus of the above specified kind, characterised in that the handset prevents supply of power to the contacat unless the electrode is fully coupled with the handset.

The handset preferably includes a second contact member that is contacted by the electrode alter the electrode is fully coupled with the first contact, the apparatus including a switch that controls supply of power to the cable such that power is supplied to the handset only when the second contact is contacted by the electrode. The supply unit may include a low power alternating signal generator that supplies an alternating signal to one of the first and second contacts, and a detector connected to the other of the first and second contacts, the detector being responsive to the alternating signal at the other contact when the electrode is fully coupled with the handset so as to enable supply of power to the handset. The handset may include user-actuable switch by which power supply to the electrode is controlled, the user-actuable switch means being disabled until the electrode is fully coupled to the handset. The handset may include two user-actuable switches, both switches being operable to conect the other of the contacts with respective lines extending to the detector. One of the lines preferably includes a unidirectional current device, the detector being responsive to rectified signals on the one line or unrectified signals on the other line to determine which of the two switches is actuated. The handset may be an electrosurgery handset and the apparatus include a large area return electrode.

Electrosurgery apparatus according to the present invention, will now be described, by way of example, with reference to the accompanying drawing, in which:

Figure 1 is a partly schematic diagram of one form of the apparatus; and

Figure 2 is a partly schematic diagram of an alternative form of apparatus.

With reference to first to Figure 1, there is shown electrosurgery apparatus in which power supply is controlled by a footswitch 1. The apparatus has a supply unit 2 with a power generator 20 that provides RF electrosurgery power at 500KHz via an output transformer 21 to an output 3. The output 3 is connected via a wire 4 in a cable 5 to a handset 6. Return power from the patient is taken from a return plate 7 via return cable 8 back to the supply unit 2.

The handset 6 has an electrically-insulative plastics housing 60 with a barrel 61 that is open at its forward end to receive the rear end or shank 62 of a metal electrode 63. The barrel 61 is closed at its rear end. Inside the barrel 61 there is a resilient metal collet or contact 64 the internal diameter of which is such that it makes a close sliding fit, and a good electrical contact, with the shank 62 of the electrode. The collet 64 is connected to the wire 4 in the cable 5 so that power can be supplied to the electrode 63 when it is coupled in the handset 6. At the rear end of the barrel 61, rearwardly of the collet 64, there is a second electrical contact 65 that is shaped and located so that it contacts the shank 62 of the electrode 63 only after it has passed the collet 64. The contact 65 is connected to a wire 66 that is preferably provided by a second core of the cable 5.

The supply unit 2 includes a low power alternating signal generator 70 (that is, with a power level below that capable of producing an electrosurgery effect) which supplies a 40KHz signal via an isolating transformer 71 to the power supply wire 4 and to a detector unit 67. The other wire 66 in the cable 5 is connected directly to the detector unit 67. This in turn is connected to a switch 23 that controls operation of the power generator 20. The detector unit 67 also receives the input from the footswitch 1. When the detector unit 67 detects the 40KHz signal and the footswitch 1 is on, the detector unit closes the switch 23 so that the power supply 20 is turned on. When no 40KHz signal is detected, or when the footswitch is off, the detector

unit 67 holds the switch 23 open so that the power supply 20 is turned off.

In normal, correct use, the shank 62 of the electrode 63 is fully inserted into barrel 61 so that it abuts the closed rear end of the barrel. In this position, the collet 64 makes electrical connection with the electrode 63 at a point forwardly of its rear end. The rear end of the electrode 63 makes contact with the second or rear contact 65 so that the two contacts 64 and 65, and hence the two wires 4 and 66, are bridged by the shank 62 of the electrode. Thus, when the surgeon depresses the footswitch 1, the detector unit 67 turns on the switch 23 causing the generator 20 to supply power to the transformer and hence to the electrode 63.

If, however, the electrode 63 were not fully inserted, and were located, for example, in the position shown by the broken lines in Figure 1, the shank 62 would not make contact with the contact 65. In this position, therefore, the detector unit 67 would maintain the switch 23 off, preventing supply of power to the handset 6. Because power is not supplied to the handset 6 when the electrode 63 is not fully inserted, there is no risk of arcing in the handset between the electrode and the handset contact 64.

Various modifications are possible. For example, it is not essential to sense full insertion of the electrode in the way described. Instead, for example, the handset could include an electrical switch with a mechanical contact that is displaced on full insertion of the electrode, so that the switch is closed and power is then supplied to the electrode contact.

Alternative apparatus is shown in Figure 2 in which the footswitch shown in the arrangement of Figure 1 is replaced by switches in the handset 6' itself.

The handset 6' is similar to that in Figure 1 except that it has two push-button switches 8 and 9 one of which is held down by the surgeon when he wishes to apply a cutting RF waveform or a coagulation waveform respectively. The cut switch 8 has a sprung contact 80 that is connected via a wire 81 to the supply unit 2', the coagulate switch 9 has a similar contact 90 that is connected via a wire 91 to the supply unit. Located beneath the two spring contacts 80 and 90 is a metal plate 100 that extends to a contact 65' of the same kind and located in the same position as the contact 65 shown in Figure 1. In their natural, rest position, both spring contacts 80 and 90 are spaced above the plate 100 so that there is no electrical connection between the contact 65' and either of the wires 81 and 91. If, however, the cut button 8 were depressed, this would push contact 80 against the plate 100 and establish contact between wires 81 and the power supply wire 4'.

The supply unit 2' includes a low power signal generator 70 that supplies a 40KHz signal via an isolating transformer 71 to the power supply line 4' and to a detector unit 67'. One of the wires 91 in the cable 5' is connected directly to the detector unit 67' whereas the other wire is connected to the detector via a diode 72 or other unidirectional current device. When the cut button 8 is depressed and contact is established between wires 81 and 4', the 40KHz signal on the power supply line 4' will be supplied via the diode 72 to the detector unit 67'. The signal received by the detector unit 67' is, therefore, a rectified half-wave signal that the detector unit identifies as a cut command. In response to this, the detector unit 67' signals the switch 23' in the power generator 20' to cause the generator to supply a cut waveform signal to the output.

Similarly, when the coagulate button 9 is depressed, the 40KHz signal on the power wire 4' is supplied via wire 91 directly to the detector unit 67' in an unrectified form. The detector unit 67' identifies this unrectified signal as a coagulate command and, accordingly, signals the switch 23' to switch the generator 20' to a coagulate waveform output.

As in the arrangement of Figure 1, if the electrode 63' were not fully coupled with the handset 6' it would not make connection with the rear contact 65' and the detector unit 67' would receive no signal from the signal generator 70. The detector unit 67' would then maintain the switch 23' open so that no power was supplied by the generator 20' to the output and hence to the power supply contact or collet 64' in the handset.

It will be appreciated that the invention could be used in other electrical apparatus having an electrode mounted in a handset to which electrical power is supplied. One example of such apparatus is electrical arc welding apparatus.

Claims

1. Electrical apparatus including a power supply unit (2, 2'), a handset (6, 6') having a contact (64, 64') that makes electrical connection with an electrode (63), and a cable (5, 5') connecting the power supply unit to the contact in the handset, characterised in that the handset (6, 6') prevents supply of power to the contact (64, 64') unless the electrode (63) is fully coupled with the handset.

2. Electrical apparatus according to Claim 1, characterised in that the handset (6, 6') includes a second contact (65, 65') that is contacted by the electrode (63) after the electrode

is fully coupled with the first contact (64, 64'), and that the apparatus includes a switch (23, 23') that controls supply of power to the cable (5, 5') such that power is supplied to the handset (6, 6') only when the second contact (65, 65') is contacted by the electrode (63).

3. Electrical apparatus according to Claim 2, characterised in that the supply unit (2, 2') includes a low power alternating signal generator (70) that supplies an alternating signal to one of the first and second contacts (64, 64'), and a detector (67, 67') connected to the other of the first and second contacts (65, 65'), and that the detector (67, 67') is responsive to the alternating signal at the other contact when the electrode (63) is fully coupled with the handset (6, 6') so as to enable supply of power to the handset.

4. Electrical apparatus according to any one of the preceding claim, characterised in that the handset (6') includes a user-actuable switch (8, 9) by which power supply to the electrode is controlled, and that the user-actuable switch (8, 9) is disabled until the electrode (63) is fully coupled to the handset (6').

5. Electrical apparatus according to Claims 3 and 4, characterised in that the handset (6') includes two user-actuable switches (8, 9), and that both switches are operable to connect the other of the contacts (65') with respective lines (81, 91) extending to the detector (67').

6. Electrical apparatus according to Claim 5, characterised in that one of the lines (81) includes a unidirectional current device (72), and that the detector (67') is responsive to rectified signals on the one line (81) or unrectified signals on the other line (91) to determine which of the two switches (8 or 9) is actuated.

7. Electrical apparatus according to any one of the preceding claims, characterised in that the handset is an electrosurgical handset (6, 6'), and that the apparatus includes a large area return electrode (7).

Fig.1.

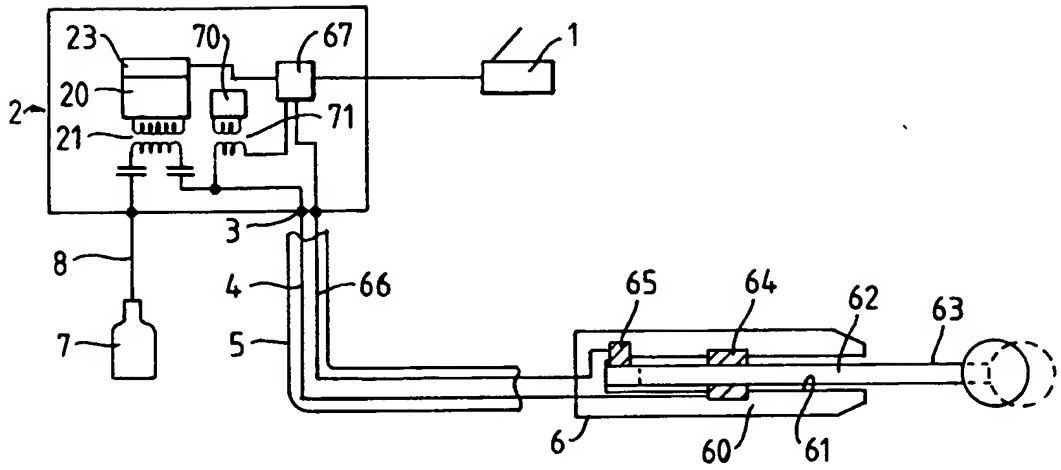

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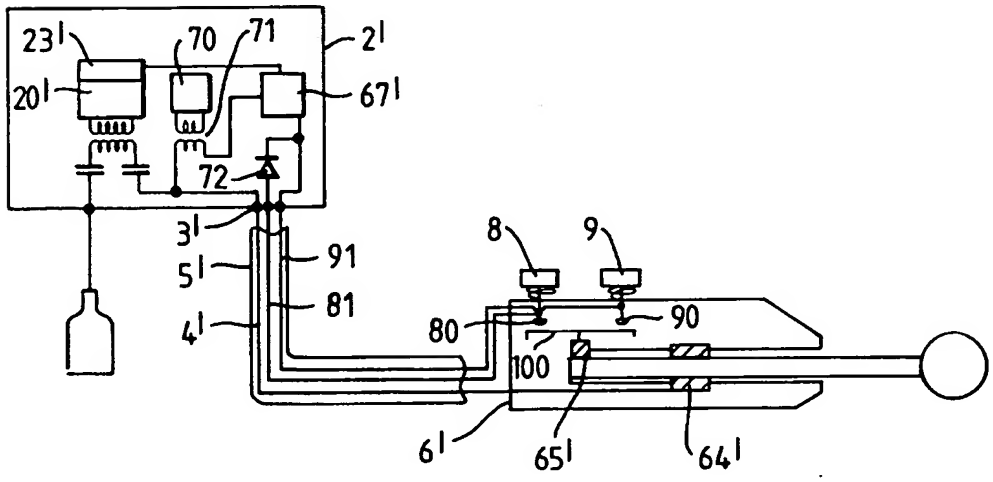
Fig.2.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European Patent Office

EUROPEAN SEARCH REPORT

Application Number EP 93302677.5

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A	AT - B - 236 579 (SIEMENS) * Claims; fig. 1 *	1	A 61 B 17/39 B 23 K 9/28
A	DE - A1 - 3 842 490 (DELMA) * Abstract; fig. 1 *	1	
A	DE - A1 - 4 012 545 (SIEMENS) * Abstract; fig. *	1	
A	GB - A - 2 144 958 (MOUNT ISA) * Abstract; fig. 1*	1	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

A 61 B
B 23 K

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
VIENNA	21-06-1993	NARDAI

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
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T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
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